

ELECTRIFICATION THE BRIDGE TO THE SUSTAINABILITY OF ENERGY FUTURE

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First of all, on behalf of Mr. Lu Yanchang, the President of CSEE, I would like to congratulate the opening of the Summer Annual Conference, wishing you a great success in the conference and your professional career.

As we enter the next century, all countries in the world share the common goal of prosperity, peace, and friendly environment for our own and future generations. Adequate and reliable energy supply are the core components for reaching this goal.

The Asian countries, with fast growth of economics and population, are facing great challenges in meeting the increasing demands for energy and electric power services, while minimizing the adverse impacts on the environment.

Taking this opportunity, I would like to present briefly the challenges China is facing and the opportunities which we may take to overcome these challenges.

CHALLENGES

With the largest population in the world and fast economic growth, the specific challenges facing China include:

| Shortage of primary energy resources per capita The primary energy consumption per capita now reaches 1.2 tone (standard coal equivalent), In coming 50 year, this figure can be increased to 2.2 tones provided that all energy resources are fully explored, including 120 GW nuclear power stations in operation.

Keep in mind that GDP per capita should be increased 10 times to hit the target of modernization, we have to reduce the energy intensity down to 20 % of the current value, otherwise import of large amount primary energy is necessary;

| Serious environmental problems of energy related emission, particularly from coal ;

| High energy intensity

Though the energy intensity (energy consumption per unit GDP output) has been reduced to 50 % of previous level in 20 years due to the changes of energy consumption pattern and the intensive efforts for energy saving, it is still very high compared with the developed countries;

| Increasing dependence on petroleum and gas import

| An incomplete energy infrastructure, especially the transmission and distribution networks and the associated inefficiency of power delivery;

| Economic and institutional barriers for the development and deployment of alternative clean energy like nuclear and renewable having negligible GHG emission.

ROLE OF ELECTRIFICATION

To tackle these problems, new innovative approaches for sustainable development will be required, with energy efficiency forming the backbone of future strategies for sustainability. Electricity will play a critical role in promoting this innovations because of its unique feature of clean, controllable

and versatility. Electrification represents the most clean, efficient and easily controlled energy and provides a basis for a modernized country.

It is recognized that increased use of electric power in many applications, could contribute to the net reduction of adverse emission, and to the improvement of ecological environment, even when the electricity is generated from fossil fuel like coal.

The serious air pollution in many Chinese big cities could be mainly attributed to direct burning of coal, especially by small size industrial boilers, in addition to other factors. It is apparent that the air quality could be greatly improved when this large amount coal is converted into electricity by efficient and clean power generation plants.

The overall energy efficiency can also be improved by using electricity for many industrial and residential applications, such as heat pump, and far infra-red radiation heating treatment, keeping in mind the great potential of efficiency improvement of new electric appliance.

Actually, it has been found by many countries that a good correlation exist between the energy intensity and the share for electricity in the total primary energy. In the case for China, the energy intensity was reduced to 50% of its previous level in the past 20 years while the share of electricity was increased from 18.6% to 32.6%. It has been shown by investigation that the contribution of energy efficiency improvement accounts for 20 % and the contribution of economic structure changes accounts for the rest.

Accelerated electrification in the rural areas is very important for sustainable development. More than 860 million people now live in the rural areas with inadequate access to commercial energy, and among them, about 60 million have no access at all to electricity. Because of excessive direct burning of bio-mass energy results in the degradation of ecological conditions and serious health problems.

That's the reason behind a program launched in recent years ,with 200 billion RMB investment, for expanding and upgrading the power distribution networks in rural areas.

CURRENT STATUS OF ELECTRIFICATION

In the past 2 decades, chinas power industry expanded at a rate in average of 8-9 %. China's installed capacity of power generation now is second only to the United States, reaching 300 GW. However, the capacity per capita is still far below that for the developed countries. In the long term, Chinese power industry is expected to develop at high rate in pace with its modernization drive.

In the short term, however, I would like to mention that China is experiencing an excess in capacity of power generation, and has taken the opportunity to shutdown many small inefficient thermal power stations, major generation projects has been deferred in some provinces. In the mean time, investment priority has been shifted to enhance the power networks.

One key energy strategy adopted in this country is converting the primary energy as much as possible into electricity by efficient processes.

As an important indicator of electrification, the share of energy consumption for electricity generation in the total primary energy consumption kept going up to 32.6 % in 1998 from 18.6% in 1980, and projected to reach 50 % in 2020.

To avoid direct burning of coal as less as possible, the coal consumption for power generation is expected to increase from the recent 32 % to 71 % in 50 years.

ELECTRIFICATION IN SUSTAINABLE MANNER

Diverse and improved technologies for more efficient and clean power generation is considered as an urgent priority for both mitigating the environmental impacts and primary energy shortage. With the implementation of regulation for controlling the air pollution, intensified efforts will be made to control SO₂ emission from coal-fired power plants with cost-effective technical solutions.

In the field of power transmission and distribution, the mission of our electrical engineers is making the networks more reliable, more effective and more flexible for the deregulated power market, by the integration of advanced power electronics and modern information technology .

In the respect of efforts to diversify the primary energy sources, the attention has been focused on the expansion of nuclear power stations and /or gas turbine generation in the coastal areas, in addition to the accelerated exploring hydropower in the west.

In spite of somewhat drawback in nuclear development in the United States and some European countries, China and other Asian countries view the nuclear power as a necessary option for ensuring the sustainability of our common earth.

In Japan, currently there are 53 nuclear power units in operation producing electricity, accounting for 35 % of its national total. Important step has been made to improve the safety and economics of nuclear power by introducing ABWR into operation, which is the first commercialized advanced reactor in the world, fully in compliance with URD requirements.

We are pleased to note that Korea has been successful in developing nuclear industry and now launches an ambitious program for building additional 40 GW nuclear power capacity by the year 2015.

In China, there are currently 3 unit in operation accounting for 2.3 GW capacity. Additional 6.4 GW nuclear capacity is now under construction. Daya Bay Nuclear Power Station, has supplied more than 70 TWh electricity to the grid since its commercial operation in 1994. Along with meeting the requirements of nuclear safety and environmental regulation, significantly improved performance has been achieved in the respect of availability, load factor and continuous safe operation without unplanned scram. In addition, substantial economic return has been yielded, enabling repay 3.34 billion US dollar, accounting for 61.6 % of its liability.

It is indicated by the operating experience that nuclear power could be made cost effective provided that safety and high availability of the facilities can be achieved by consistent innovation and modern management.

In the aspect of natural gas utilization, As an important effort in exploring the energy resources in the western parts of China, the construction of a trunk gas pipeline from Xinjiang to Shanghai area now is under active preparation. Combined cycle power plants will be build in connection with this project. In Guangdong province, 3000 MW or more LNG power plants is scheduled to build by the year of 2010.

With the objective to explore the vast hydropower resources in west of China, several large hydropower plants, such as those in the upper reaches of Yellow river, and in Yingnan and

Guangxi provinces ,will be constructed in the tenth Five Year Plan period. Since 80% of hydropower resources are located in the west part of China, far from population centers. Bulk power long distance transmission is required to deliver these energy to the load centers. In meeting the needs for bulk power transmission, a new high voltage level of 750 kV will be introduced in the North west network. It is understood that great progress has been made by Korean research institutions and leading manufacturers in the implementation of 765 kV system.

INNOVATION IS CRITICAL

These objectives for our sustainable future can only be reached by taking the opportunity of worldwide technology innovations and the institutional changes in power sectors. We feel that particularly important is supporting research and development in power technologies and adopting policies that encourages selecting efficient and environmentally sound technologies.

Ladies and gentleman

It is well understood the great challenges we are facing could be overcome by international cooperative efforts. This is evident with the globalization of our national economies, the worldwide nature of environment, the global nature of technological innovations. The actions taken within national boundaries will have impacts far beyond its borders.

Two years ago, when a CIGRE Working Group was discussing the interconnections of power networks in the East Asian Countries, including that between North and South Korea Peninsula, the comments of most experts are : technically it is feasible but very difficult in reality. Several years ago, when Korean experts once approached us with an initiative for HVDC interconnection between Korean and Shangdong peninsula, my immediate response was: the proposal was very interesting but not feasible.

However, with a view looking into the future, with the increased globalization of economics and mutual understanding between the countries in the region, and the increased common desire to live in a more harmonized and sustainable world, I believe the good wishes will become a reality in near future.

Therefore, we cherish the successful cooperation between our electrical communities and look forward to further cooperation in the coming years

Finally, I would like to take this opportunity to extend to all of you our good wishes for a successful KIEE conference, bright prosperity and nations reunion.

Thank you for your attention.